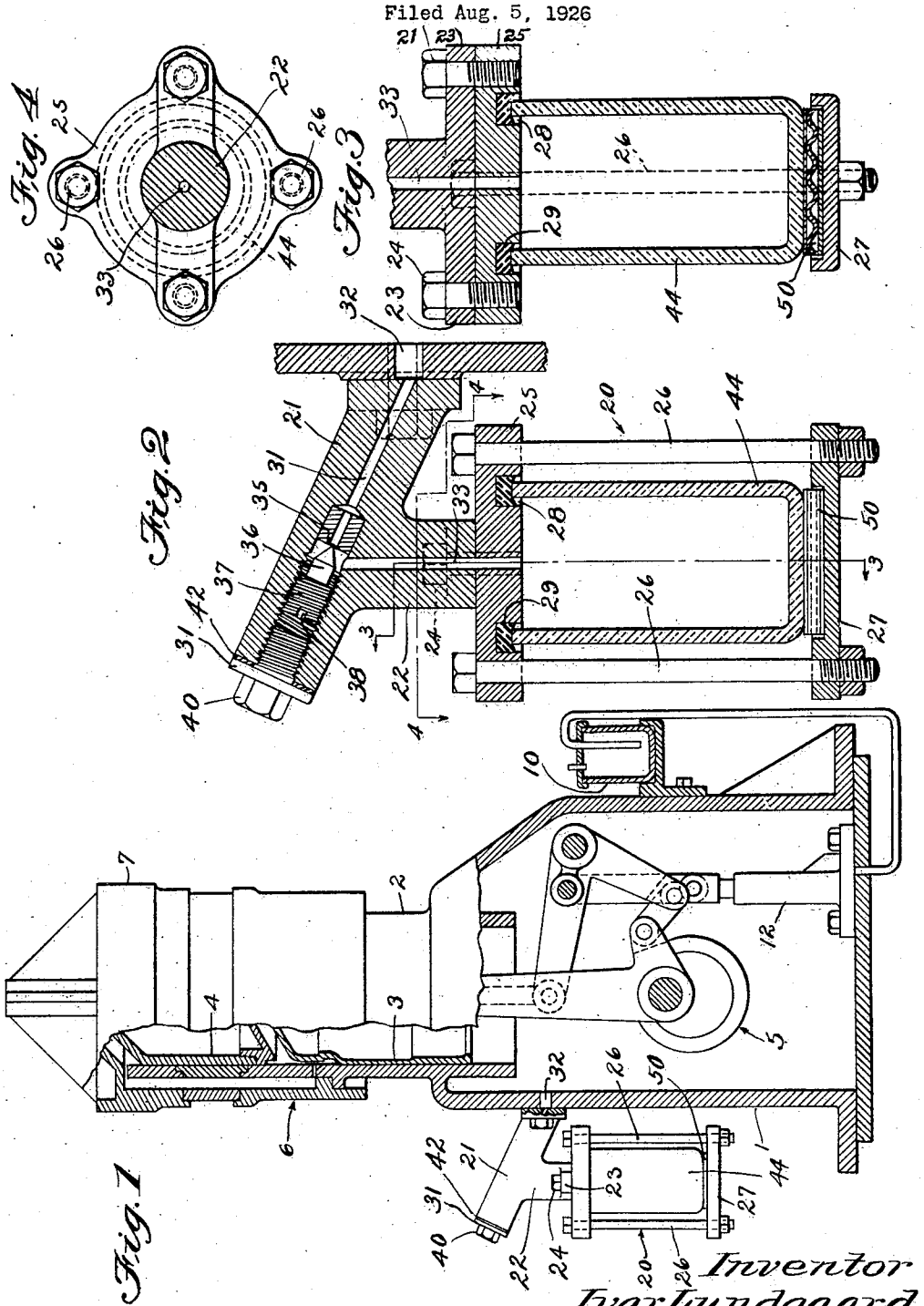
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AIR DRIER

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AIR DRIER

Application filed August 5, 1926. Serial No. 127,295.

This invention relates to refrigerating apparatus which uses air as a mediating fluid and more particularly relates to the provision of an auxiliary or pressure drier adapted to be used in conjunction with an initial drier to abstract moisture from air within the machine.

This combination may be advantageously used, for example, in a refrigerating machine of the general type disclosed in my prior Patent No. 1,240,862, in which a substantially constant volume of air is used as a mediating fluid for refrigeration purposes and in which it is highly desirable, if not essential, to have practically all moisture removed from the air. In machines of this character the presence of moisture in the air will result in the formation of frost which will often collect in sufficient quantities to clog the air passages, being particularly difficult to remove without dismantling the machine or using methods requiring special apparatus or the like. As disclosed in my prior Patent No. 1,240,862 and in my pending application No. 691,165, filed February 7, 1924, I prefer to provide an initial drier which is adapted to remove substantially all of the moisture in the air entering the machine. The auxiliary or secondary drier is adapted to be used in conjunction with such an initial drier to provide additional insurance against the occurrence of moisture in the mediating fluid; for example, serving to absorb moisture in the air which is in the apparatus when it is first assembled or has been lying idle for a long time, to absorb moisture which has accidentally passed by the initial drier due to the exhaustion of its moisture absorbing qualities or due to other reasons, as well as to remove moisture which may adhere to the metal parts, or may be suspended in the lubricating oil, which will probably be renewed from time to time during the use of the machine. The combination of the initial or intake drier and the auxiliary or pressure drier is comparatively immune to neglect and requires attention only at very long intervals of time in order to retain the mediating fluid in a dry condition.

The above and further objects and advantages of the invention will become apparent to those skilled in the art upon a reading of the subjoined description and claims in conjunction with the accompanying drawings in which,

Fig. 1 is a view partly in elevation and partly in section of a refrigerating machine illustrating one specific embodiment of my invention;

Fig. 2 is a vertical section of the pressure drier;

Fig. 3 is a section on line 3—3 of Fig. 2; and

Fig. 4 is a section on line 4—4 of Fig. 2.

As shown in Fig. 1, the improved refrigerating machine, in which the pressure drier more particularly forming the subject matter of the present invention may be advantageously used, comprises a crank case 1, an upstanding cylinder 2 provided with a compression piston 3 and a shifter piston 4 and with air ducts leading along the cylinder wall from the compression chamber between the two pistons to the expansion chamber in the head of the cylinder. Suitable mechanism indicated generally by the numeral 5 is designed to operate the two pistons in proper sequence to compress the air in the lower chamber, to pass it by cooling means, indicated in general by the numeral 6, to the upper chamber, to effect its expansion and consequently refrigeration through the exposed surface 7, and then to return it to the compression chamber and to repeat the cycle, all as more specifically explained in my above identified prior patent. While the average air pressure within the machine may be atmospheric, it is preferred to have the make-up pump 12 designed to maintain the average internal pressure considerably above that pressure.

At one side of the crank case is located a suitable initial drier 10 which may comprise a vessel preferably of glass and containing any suitable chemical adapted to absorb moisture from air drawn into the machine by a suitable intake or make-up pump indicated by the numeral 12. The initial drier 10 may contain for example, phosphorus

pentoxide, calcium chloride, phosphoric acid, or any other substance having similar suitable moisture absorbing properties. Ordinarily air drawn into the machine will be dried by passing through the drier 10 and will, therefore, occur within the crank case and cylinders only in a dry condition. Since the vessel 10 is ordinarily provided with transparent walls, the chemical may be readily observed and renewed when it is saturated with moisture drawn from the air.

The pressure drier 20 preferably comprises a glass vessel 44 supported by a suitable bracket 21 bolted to the side of the crank case 1. The bracket comprises an upwardly inclined tubular body portion with a depending extension intermediate its ends which is provided with an outstanding flange 23 adapted to receive detachable fastenings 24. These fastenings secure a plate 25 to the bracket 21, this plate being provided with ears which receive bolts 26 adapted to support a lower plate 27; the vessel 44 being clamped between plates 25 and 27 by bolts 26. Between the vessel and plate 27 is interposed suitable packing 50, such as corrugated paper, while a suitable recess 28 in the lower surface of plate 25 receives cushioning material 29, such as rubber, in order to protect the upper edge of vessel 44.

Bracket 21 is provided with a suitable duct 31 communicating with opening 32 in the wall of the crank case and connecting with a duct 33 in the depending extension 22 of the bracket. The latter duct has an extension in the plate 25 whereby the vessel 44 may communicate with the interior of the crank case 1. Between ducts 31 and 32 is interposed a suitable valve seat 35 preferably of suitable non-ferrous metal, which is adapted to be engaged by a needle valve 36 upon the end of a screw 37 having a slot 38 in its head and being threaded into the bracket 21. A cap screw 40 is adapted to hold a metal washer 31 against a compressible washer or gasket 42 which in turn engages the outer end of the bracket 21, thereby comprising an air-tight closure for the passages within the bracket 21 so that the vessel 44 may communicate with the interior of the crank case by a suitable air passage, but may be sealed from outer air.

Normally the vessel 44 may contain any suitable moisture absorbing material such as named above, and the needle valve will be slightly opened so that a surge of air will occur through the passages 31 and 33 and by the needle valve 36 in response to variations in internal pressure within the crank case due to the piston movement. Since the pistons do not provide an air-tight seal, air will leak by them into the crank case and back into the cylinder at different portions of the cycle and ultimately all of the air will have surged into the drier 20. Since vessel 44 is provided with a transparent glass wall the condition of the material therein may be readily observed and when its moisture absorbing qualities have been exhausted, the vessel may be removed. The needle valve 36 has been provided so that such a proceeding may take place without materially affecting the air within the crank case or permitting the leakage of air, since removal of the cap screw 40 and closing of the needle valve by the use of a suitable tool will prevent the escape of more than a small amount of air. After the needle valve is closed the drier assembly may be removed by detaching the fastening members 24. Preferably the plates 25 and 27 together with connecting bolts 26 and vessel 44 will be provided as a unit by the service station when it is desired to renew the moisture absorbing material, it being obvious, however, that the vessel 44 may itself be readily removed by unclamping the bolts 26 and separating the vessel from the plates.

I claim:

1. Refrigerating apparatus adapted to use air as a mediating fluid and comprising pistons for compressing and expanding the mediating air, an intake duct connecting the interior of the machine with the atmosphere, a drier for absorbing moisture from air passing through said duct, and a second drier communicating with the interior of the machine and sealed from the outer air and adapted to receive the surge of air due to piston movement, said second-named drier being detachably secured to the machine and connected thereto by a single air passage, and means for closing said passage in order to keep the interior of the machine sealed from the outer air when the drier is removed.

2. Air refrigerating apparatus adapted to use air as a mediating fluid and comprising a cylinder, a crank case, and a piston reciprocable in the cylinder, a drier comprising a vessel sealed from the outer air and containing a moisture absorbing chemical, a bracket securing the vessel to the crank case, said vessel being detachably secured to the bracket, a passage extending through the wall of the crank case and the bracket to the vessel, and means for closing the passage.

3. Air refrigerating apparatus adapted to use air as a mediating fluid and comprising a cylinder, a crank case, and a piston reciprocable in the cylinder, a drier comprising a vessel sealed from the outer air and containing a moisture absorbing chemical, a bracket securing the vessel to the crank case, a passage extending through the wall of the crank case and the bracket to the vessel, and a needle valve and seat for closing the passage.

4. Air refrigerating apparatus adapted to use air as a mediating fluid and comprising

a cylinder, a crank case, and a piston reciprocable in the cylinder, a drier comprising a vessel sealed from the outer air and containing a moisture absorbing chemical, a bracket securing the vessel to the crank case, a passage extending through the wall of the crank case and the bracket, means for detaching the vessel from the bracket and a screw controlled needle valve for closing the passage.

5. Air refrigerating apparatus adapted to use air as a mediating fluid and comprising a cylinder, a crank case, and a piston reciprocable in the cylinder, a drier comprising a vessel sealed from the outer air and containing a moisture absorbing chemical, a bracket detachably securing the vessel to the crank case, a passage extending through the wall of the crank case and the bracket to the vessel, means for detaching the vessel from the bracket and a needle valve in the bracket for closing the passage, and a detachable closure member normally providing an air tight seal over the needle valve.

6. Refrigerating apparatus adapted to use air as a mediating fluid and comprising pistons for compressing and expanding the mediating air, a drier connected with the interior of the machine and sealed from the outer air and adapted to receive the surge of air due to piston movement, said drier being detachably secured to the machine and connected thereto by a single air passage, and means for closing said passage in order to keep the interior of the machine sealed from the outer air when the drier is removed, said drier including a vessel adapted to contain a moisture absorbing chemical and having a transparent wall to permit observation of its contents for consequent determination of the need of removing the drier.

Signed by me at Boston, Massachusetts, this 2nd day of August, 1926.

IVAR LUNDGAARD.